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Before the
FEDERAL COMMUNICATIONS COMMISSION
Washington, D.C. 20554

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FEDERAL COMMUNICATIONS COMMISSION
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In the Matter of

Amendment of Part 2 of the
Commission's Rules to Allocate the
455-456 MHz and 459-460 MHz bands
to the Mobile-Satellite Service

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ET Docket No. 97-214

To: The Commission

COMMENTS OF FINAL ANALYSIS COMMUNICATION SERVICES, INC.

FINAL ANALYSIS COMMUNICATION SERVICES, INC.

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TABLE OF CONTENTS

EXECUTIVE SUMMARY	i
I. INTEREST OF FINAL ANALYSIS	2
II. ADDITIONAL UPLINK SPECTRUM IS NECESSARY TO FACILITATE THE COMPETITIVE DEPLOYMENT OF LITTLE LEO SYSTEMS. . . .	2
III. SHARING BETWEEN LITTLE LEO OPERATORS AND INCUMBENT FIXED AND MOBILE SERVICE OPERATIONS IN THE 455-456 MHz and 459-460 MHz BANDS IS FEASIBLE.	5
A. Sharing Between Little LEO Operators and Existing Users in the 455- 456 MHz Band Is Feasible.	6
B. Sharing Between Little LEO Operators and Existing Users in the 459- 460 MHz Band Is Feasible.	8
C. Sufficient Spectrum Sharing Capacity and Spectrum Sharing Techniques Exist to Permit Little LEO Operations in the 455-456 MHz and 459- 460 MHz Bands.	9
IV. THE FUTURE FCC AUCTION OF PAGING LICENSES IN THE 459-460 MHz BANDS SHOULD NOT INHIBIT PRIMARY ALLOCATION OF THE ENTIRE 455-456 MHz AND 459-460 MHz BANDS TO LITTLE LEOS.	10
V. CONCLUSION	12

EXECUTIVE SUMMARY

Final Analysis Communication Services, Inc. ("Final Analysis") strongly supports the Commission's adoption of the proposal in this *Notice* to allocate the 455-456 MHz and 459-460 MHz bands (collectively, the "WRC-95" bands) to Little LEOs for uplink operations. Allocation of the WRC-95 bands to Little LEOs will facilitate the Commission's goal of encouraging the rapid deployment of commercial Little LEO services. Additional uplink spectrum is critical to accomplish this goal because the availability of existing spectrum allocated for uplink bands for Little LEOs is extremely limited and further constrained by the requirement to share with multiple existing government and commercial satellite operations. In addition, Little LEO-based communications require more uplink spectrum than downlink spectrum in a ratio of approximately 2-to-1. Finally, unimpeded access to uplink spectrum by Little LEOs is especially critical for uplink feeder links where continuous access between the Little LEO satellite and gateway earth stations is required.

Sharing between Little LEOs and existing terrestrial fixed and mobile services in the WRC-95 bands is eminently feasible. Existing broadcast remote auxiliary use in the 455-456 MHz band and paging and other fixed and mobile operations in the 459-460 MHz band possess predictable operating characteristics that Little LEO systems can accommodate as described below.

Moreover, use of the WRC-95 bands by these existing services is limited. Given these limitations on existing operations, frequency-avoidance techniques to be used by Little LEOs such as Dynamic Channel Activity Assignment System ("DCAAS"), low duty cycles, and brief message duration, will be highly effective to make sharing between Little LEOs and existing fixed and mobile operations in the WRC-95 bands feasible. The existing

WRC-95 spectrum sharing analyses -- including but not limited to the IWG-2A study -- support the conclusion that sharing between Little LEOs and existing users in the WRC-95 bands is feasible.

Final Analysis believes that the Commission plans for future auction of paging and other licenses in the 459-460 MHz band as discussed in the *Notice* at ¶ 13 should not inhibit the primary allocation of the entire 455-456 and 459-460 MHz bands to Little LEOs because there is a current demonstrated need for the allocation of this spectrum to Little LEOs while the future auction of lower-band paging in the 454-460 MHz bands does not appear to be imminent and is unlikely to occur in 1998. A decision to make Little LEOs secondary to such uncertain and unpredictable future assignments and usages would completely undercut the value of the spectrum to Little LEOs. On the other hand, any accommodation that potential future paging licensees in the 459-460 MHz band will have to make to incumbent Little LEO operators can be reasonably reflected in the market price. the FCC.

The Commission has stated that it is dedicated to expeditious processing of second round applications for Little LEO licenses in order to promote the rapid deployment of commercial Little LEO services. Consistent with this ruling, Final Analysis urges the Commission to allocate the entirety of the 455-456 MHz and 459-460 MHz bands to Little LEOs on a primary basis for uplink operations as soon as possible.

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Final Analysis Communication Services, Inc. ("Final Analysis"), by its attorneys and pursuant to Sections 1.415 and 1.419 of the Commission's rules, 47 C.F.R. §§ 1.415, 1.419, hereby submits these comments on the above-captioned proceeding.¹ The *Notice* proposes to allocate the 455-456 MHz and 459-460 MHz bands to the non-voice, non-geostationary mobile satellite service ("NVNG MSS" or "Little LEOs"). For the reasons discussed below, Final Analysis urges the Commission to allocate the 455-456 MHz and 459-460 MHz bands to Little LEOs as proposed in the *Notice*.²

¹ See *Amendment of Part 2 of the Commission's Rules to Allocate the 455-456 MHz and 459-460 MHz bands to the Mobile-Satellite Service*, Notice of Proposed Rulemaking, ET Docket No. 97-214, FCC 97-363 (released on October 14, 1997) ("*Notice*").

² While this proceeding concerns domestic allocation of spectrum allocated to Little LEOs at WRC-95, Final Analysis also urges the Commission to initiate proceedings as expeditiously as possible to allocate domestically the 1 MHz of spectrum allocated to Little LEOs at WRC-97.

I. INTEREST OF FINAL ANALYSIS

Final Analysis is building and preparing to launch and operate a worldwide, digital Little LEO satellite telecommunications system that will offer low-cost, high-quality two-way data transmission services such as paging, e-mail, data acquisition, fixed and mobile asset tracking and position location determination. Final Analysis has a second-round application pending before the FCC for authority to launch and operate its proposed "FAISAT" Little LEO satellite constellation.³ Thus, Final Analysis has a significant interest in this proceeding given that allocation of additional spectrum to Little LEOs will facilitate the commercial deployment of Little LEO systems.

II. ADDITIONAL UPLINK SPECTRUM IS NECESSARY TO FACILITATE THE COMPETITIVE DEPLOYMENT OF LITTLE LEO SYSTEMS.

Final Analysis agrees with the Commission's tentative conclusion that "additional spectrum for NVNG MSS is needed to facilitate the competitive development of the Little LEO service." *Notice* at ¶ 9. Additional uplink spectrum for Little LEOs is especially important considering that: (i) Little LEO operations require more uplink spectrum than downlink spectrum; and (ii) the availability of the existing spectrum allocated for Little LEO operations in the 148.0-150.05 MHz and 399-400.05 MHz bands is extremely limited by the requirement to share with several incumbent government and commercial satellite operations in those bands, and the current feeder link spectrum is woefully inadequate and only marginally useful given current sharing constraints.

³ See Application of Final Analysis Communications Services, Inc. for Authority to Construct, Launch and Operate a Low-Earth Orbit Satellite System, File Nos. 25-SAT-P/LA-95; 76-SAT-AMEND-95; 89-SAT-AMEND-96; 151-SAT-AMEND-96; 7-SAT-AMEND-98.

The additional uplink spectrum proposed to be allocated to Little LEOs in this proceeding is necessary to accommodate the high demand for uplink spectrum required by Little LEO-based communications. According to a recent study by ITU-R Working Group 8D and Final Analysis's study of the Little LEO market, the ratio of uplink-to-downlink spectrum required for commercial Little LEO operations will be approximately 2-to-1.⁴ There are several reasons why service uplink operations for Little LEOs demand more capacity than service downlink operations. For instance, Little LEO applications such as automated meter reading, environmental data collection and asset tracking will require a batch of uplinks from individual remote terminal units and assets tracked, as compared to only one mass downlink to the gate station via the feeder link. Thus, allocation of the additional uplink spectrum in the 455-456 MHz and 459-460 MHz bands to Little LEOs is essential to help meet the high premium that consumers of Little LEO services will place upon uplink communications.

Moreover, the existing spectrum allocated for Little LEO uplinks in the 148.0-150.05 MHz and 399-400.05 MHz bands must be shared with other satellite operations. Shared access to these bands significantly limits their availability for Little LEO uplink communications. This is particularly a concern for uplink feeder link communications where continuous access between the Little LEO satellites and earth station gateways is necessary.

⁴ See Comments of Final Analysis Communication Services, Inc., filed in IB Docket No. 96-220 at Exhibit 2 *Systems Analysis* at 2 ("Final Analysis Comments"); see also Final Analysis Comments at Attachment B -- ITU-R Sub-Working Group 8D3A-6, Document 8D/TEMP/128-E, *Spectrum Demand for Non-GSO MSS Below 1 GHz Services* at §§ 3.1-3.2 (Nov. 5, 1996) (estimates that approximately 13.6 MHz of spectrum will be required for uplink operations on a shared basis in comparison to approximately 7 MHz of spectrum required for downlink operations on a shared basis).

Finally, the record in the *Little LEO* proceeding shows that Little LEOs will require an additional 21 MHz of spectrum⁵ on a shared, worldwide basis to deploy commercial systems that will sufficiently meet the demand for near-real time Little LEO applications.⁶ Moreover, allocating additional spectrum to Little LEOs in the 455-456 and 459-460 MHz bands is consistent with Resolution 214 of WRC-95 which recognizes the need for allocation of additional spectrum to mobile satellite service ("MSS") operations, including Little LEO operations, below 1 GHz to meet projected demand for such services.⁷ Accordingly, allocating additional spectrum to Little LEOs in the 455-456 MHz and 459-460 MHz bands is vital to facilitate uplink communications for Little LEO operations.

⁵ See ITU-R Sub-Working Group 8D3A-6, Document 8D/TEMP/128-E, *Spectrum Demand for Non-GSO MSS Below 1 GHz Services*, dated November 5, 1996 ("Working Group 8-D Spectrum Demand Study") (attached as Attachment B to Comments of Final Analysis Communication Services, Inc., filed in IB Docket No. 96-220 on December 20, 1996). This 21 MHz of additional spectrum excludes the existing allocation of approximately 3.5 MHz of spectrum already allocated to Little LEOs on a worldwide primary shared basis at the World Administrative Radio Conference in Torremolinos, Spain in 1992 ("WARC-92"). See Working Group 8-D Spectrum Demand Study at p.11.

⁶ See *Amendment of Part 25 of the Commission's Rules to Establish Rules and Policies Pertaining to the Second Processing Round of the Non-Voice, Non-Geostationary Mobile Satellite Service*, Notice of Proposed Rulemaking, IB Docket No. 96-220, FCC 96-426 (released October 29, 1996) ("*Little LEO Notice*"); see also Comments of Final Analysis Communication Services, Inc., filed in IB Docket No. 96-220 on December 20, 1996.

⁷ See *id.* Three other Resolutions -- COM5-14, COM5-15, and COM5-25 -- approved at WRC-97 also call for additional spectrum sharing studies in the bands 470-862 MHz, around 1.4 GHz, and 405-406 MHz in support of the industry's call for additional spectrum allocations in the face of the demonstrated scarcity of spectrum allocated and available currently.

III. SHARING BETWEEN LITTLE LEO OPERATORS AND INCUMBENT FIXED AND MOBILE SERVICE OPERATIONS IN THE 455-456 MHz and 459-460 MHz BANDS IS FEASIBLE.

The *Notice* seeks comment on the ability of Little LEO operators to share with incumbent terrestrial fixed and mobile service operations in the 455-456 MHz and 459-460 MHz bands. *See Notice* at ¶ 11. Based on its extensive operational experience with satellite design and operations, as discussed in this section, Final Analysis believes that sufficient spectrum sharing capacity exists to allow shared operations between incumbent fixed and mobile users and Little LEO operations licensed in the WRC-95 bands. Spectrum sharing techniques exist to allow Little LEO operations in these bands without causing harmful interference to incumbent users.

Pursuant to an experimental Little LEO satellite authorization from the FCC,⁸ Final Analysis has designed and launched two experimental satellites. Its second satellite, the FAISAT-2v, was launched on September 23, 1997. Through its satellite operations, analytical review, and laboratory tests, Final Analysis has conducted extensive analyses of spectrum-sharing and coordination techniques to facilitate commercial Little LEO operations in bandwidth shared with government satellite constellations. Based on this experience, Final Analysis believes that sharing between Little LEO operations and fixed and mobile service operations in the 455-456 MHz and 459-460 MHz bands is feasible.

In addition, both of these bands were the subject of extensive study and analysis to determine their feasibility for sharing with Little LEO systems prior to their being included in the U.S. position for allocation for service uplinks at WRC-95. As a result of this

⁸ *See* Final Analysis, Inc., Experimental "FAISAT-2v" Satellite Radio Authorizations under FCC call signs KS2XCY, KS2XCZ, KS2XDA and WA2XHE.

analysis, the entire industry supported the proposed allocation of these bands, considering them to be part of the "optimal 10 MHz of spectrum for sharing by NVNG MSS" and declaring them to be capable of supporting uplink bands.⁹ ITU Study Group 8/3 reported that sharing is compatible with NVNG MSS and existing users by using dynamic channel assignment or low power CDMA systems. Since 1995 there has been no indication that the incumbent usage of these bands has materially changed in such a way as to alter the conclusion that these bands are suitable for sharing with NVNG MSS service uplinks. Moreover, many studies prepared, presented and "vetted" by various U.S. and international forums have verified that allocating the 455-456 MHz and 459-460 MHz bands to Little LEOs in Region 2 is both feasible and efficient. Thus, failing to allocate these bands to Little LEOs in Region 2 would be contrary to the informed technical opinions espoused by the world body of the ITU in 1995.

A. Sharing Between Little LEO Operators and Existing Users in the 455-456 MHz Band Is Feasible.

As the Commission points out in *Notice* at ¶ 12, there are a finite number of existing users of the 455-456 MHz band which is allocated on a primary basis to broadcast TV and radio licensees for auxiliary mobile communications between the studio and remote locations. Such use is highly intermittent, with the heaviest use clustered around major metropolitan areas, and limited to specific times of the day. Moreover, use of the 455-456 MHz band for remote mobile communications in the broadcast services is neither heavy nor continuous and

⁹ See Joint Supplemental Reply Comments filed by CTA Commercial Systems, Inc., E-SAT, Inc., Final Analysis Communication Services, Inc., GE American Communications, Inc., Leo One USA Corp., Orbital Communications Corp., Starsys Global Positioning, Inc., and Volunteers in Technical Assistance in IC Docket No. 94-31 on May 18, 1995 ("WRC-95 Joint Supplemental Reply Comments").

is limited primarily to "transmission of material from the scene of events back to studio, communications related to production of remote programs and technical support including cues, orders, dispatch instructions, frequency coordination and establishing microwave links for telemetry and control." *See* WRC-95 Joint Supplemental Reply Comments at 11; *Notice* at ¶ 5 n.6. Thus, current users of the band are limited to a manageable and finite number and band use is highly dependent on geography and time. Based on these factors, use of the 455-456 MHz band for NVNG MSS service uplinks can be structured to accommodate these fairly unique parameters in order to permit sharing without causing harmful interference to incumbent users or constraining future use of the band for broadcast auxiliary services.

The techniques used by Little LEO operations to avoid interference include Dynamic Channel Activity Assignment System ("DCAAS"), low duty cycles, and brief message duration. Moreover, Final Analysis employs a interference avoidance system based on DCAAS techniques called Scanning Telemetry Activity Receiver System ("STARS"). STARS/DCAAS will enable Little LEO satellite to scan the bands and measure the received power, with channels for transmission selected based on a weighted average measurement of channel usage in order to avoid interference. The low duty cycle of NVNG MSS transmissions would be highly unlikely to preclude use of a channel by a broadcast auxiliary remote pickup station. The short duration of NVNG MSS transmissions (450 milliseconds or less) likewise has little potential of causing unacceptable interference to auxiliary broadcast transmissions. These elements combined with the relatively low level of incumbent usage of this band make the 455-456 band highly suitable for NVNG MSS feeder uplinks.

B. Sharing Between Little LEO Operators and Existing Users in the 459-460 MHz Band Is Feasible.

The 459-460 MHz band is allocated on a primary basis for terrestrial fixed and mobile services licensed under Part 22 of the Commission's rules.¹⁰ Avoiding interference with existing terrestrial fixed and mobile users in the 459-460 MHz is highly feasible because incumbent use is limited and incumbent operations are both highly structured and predictable. Fixed and mobile users in the 459-460 MHz band operate in highly structured bandwidths. Transmissions in these services are mostly characterized by very smooth and regular noise/interference pattern. Moreover, the overall level of usage of "push-to-talk" mobile telephony in the Domestic Public Land Mobile Radio Service ("DPLMRS") in the 459-460 MHz band is declining due to migration to cellular phones. *See* WRC-95 Joint Supplemental Reply Comments at 12.¹¹ A pre-WRC-95 engineering study which monitored fixed and mobile operations in the 459-460 MHz band showed relatively few transmissions in that band notwithstanding the fact that there are approximately 80,000 transmitters authorized in the band. Thus, incumbent use of the 459-460 MHz band by terrestrial fixed and mobile operators is low and intermittent.

¹⁰ These services include Basic Exchange Telephone Radio Service ("BETRS"), public land mobile one-way or two-way operations, air-to-ground public radio telephone service, and rural radio services, as well as for petroleum radio services licensed under Part 90 of the Commission's rules and maritime mobile services licensed under Part 80 of the Commission's rules.

¹¹ The Commission has acknowledged the increase in the number of cellular subscribers employing cellular technology for two-way mobile voice communications of 40 percent in 1996 and 30 percent in 1996. *See Annual Report and Analysis of Competitive Market Conditions With Respect to Commercial Mobile Services*, Second Report, FCC 97-75 at Table 1 "Cellular Growth" released March 25, 1997.

Given the regular and limited usage patterns of incumbent terrestrial mobile operators in the 455-456 MHz band, use of STARS/DCAAS frequency-avoidance techniques can be highly effective in avoiding interference. Employing STARS/DCAAS frequency-avoidance techniques in Little LEO operations will cause Little LEO transmissions to occur only in the troughs between the current operators' usage peaks, resulting in shared operations without harmful interference. As mentioned above, in addition to STARS/DCAAS frequency-avoidance techniques, Little LEO systems will possess other operational characteristics, such as low duty cycles, and brief message durations, that will avoid interference with existing users in 459-460 MHz band. *See* Section A *supra*.

C. Sufficient Spectrum Sharing Capacity and Spectrum Sharing Techniques Exist to Permit Little LEO Operations in the 455-456 MHz and 459-460 MHz Bands.

The FCC suggests in the *Notice* at ¶ 15 that additional analysis may warranted regarding sharing between Little LEOs and incumbent users in the 455-456 and 459-460 MHz bands. Final Analysis believes that this question has been sufficiently studied by Informal Working Group 2A ("IWG-2A") and supports its conclusion that sharing in these bands is feasible. While the IWG-2A study may not have "specifically focus[ed]" on the 455-456 MHz and 459-460 MHz bands in its report, it must be emphasized that the IWG did study these bands as part of its review of the feasibility of sharing between Little LEO uplinks and land mobile users in the 450-470 MHz band, a band that encompasses the 455-456 MHz and 459-460 MHz bands at issue in this proceeding. Given the usage rate in these bands in Region 2, Final Analysis believes that operations using the STARS/DCAAS techniques can readily allow for Little LEO uplink operations without interference to

incumbents. Other aspects of incumbent usage also lend themselves to effective sharing techniques, as discussed in Sections A and B *supra*.

With regard to the Commission's discussion of availability of sufficient spectrum capacity for sharing in the 455 and 459 MHz bands, Final Analysis also takes exception to Motorola's suggestion that the 148 MHz band is less congested than the 455 and 459 MHz bands.¹² Final Analysis launched an experimental satellite in September of this year and, although the satellite is still in early orbit operations, initial measurements from it do not support Motorola's contention. Rather, this preliminary data from the experimental satellite suggests that the 455 and 459 MHz bands are indeed much cleaner than the 148 MHz band. In any case, regardless of the comparative level of congestion in the 455 and 459 MHz bands and the 148 MHz band, the STARS/DCAAS techniques will allow shared use without causing harmful interference to incumbent users.

IV. THE FUTURE FCC AUCTION OF PAGING LICENSES IN THE 459-460 MHz BANDS SHOULD NOT INHIBIT PRIMARY ALLOCATION OF THE ENTIRE 455-456 MHz AND 459-460 MHz BANDS TO LITTLE LEOS.

The FCC seeks comment on whether it should "not allocate certain portions" of the 459-460 MHz band to Little LEOs in view of its plans in the *Future of Paging* proceeding¹³ to license future common carrier paging, BETRS and rural radio telephone services by auction. See *Notice* at ¶ 13. In particular, the *Notice* seeks comment on whether the

¹² Cf. *Notice* at ¶ 15 n.32 (citing Motorola Comments in Ref. No. I-S-P-96-005 ("Joint Preliminary Draft Proposals for WRC-97") at 16-17 & n.24).

¹³ See *Revisions of Part 22 and Part 90 of the Commission's Rules to Facilitate Future Development of Paging Systems; Implementation of Section 309(j) of the Communications Act -- Competitive Bidding*, Second Report and Order and Further Notice of Proposed Rulemaking, 12 FCC Rcd 2732, 2748-9 ¶¶ 23-25 (1997) ("*Future of Paging*").

primary allocation of spectrum in the 459-460 MHz band to Little LEOs would impact the "feasibility of auctioning" the 459.025-459.65 MHz segment of that band to future terrestrial common carrier paging and other terrestrial mobile licensees. *Id.* While Final Analysis takes no position on the feasibility of auctioning paging spectrum in the 459-460 MHz band as discussed in the *Future of Paging* proceeding, it does believe that such future auctions should not hinder the allocation of the 455-456 MHz and 459-460 MHz bands to Little LEOs in this proceeding.

There is a current demonstrated need for the allocation of this spectrum to Little LEOs. According to the FCC's auction schedules, future auction of lower-band paging in the 454-460 MHz bands do not appear to be imminent and are unlikely to occur in 1998.¹⁴ A decision to make Little LEOs secondary to such uncertain and unpredictable future assignments and usages would completely undercut the value of the spectrum to Little LEOs.¹⁵ On the other hand, any accommodation that potential future paging licensees in

¹⁴ The FCC's recently announced schedule of auctions for 1998 has dropped lower-band paging in the 454-460 MHz band from the 1998 auction schedule. *See* Public Notice, *FCC Announces Spectrum Auction Schedule for 1998*, DA 97-2497, released on November 25, 1997.

¹⁵ For instance, when the FCC allocated the WARC-92 spectrum in the 148-149.9 MHz uplink band to Little LEOs in 1993, it also provided in footnote US325 to the Table of Frequency Allocations that *future* co-channel government fixed and mobile service licensees in the 148-149.9 MHz band are not entitled to interference protection from Little LEO uplink communications. *See Amendment of Section 2.106 of the Commission's Rules to Allocate Spectrum to the Fixed-Satellite Service and the Mobile-Satellite Service for Low-Earth Orbit Satellites*, Report and Order, 8 FCC Rcd 1812, 1814 ¶¶ 15-17. The FCC reasoned that requiring Little LEOs to protect both existing *and future* government mobile and fixed operations in the 148-149.9 MHz uplink bands from interference would have been "too restrictive" on Little LEOs. *See id.*

the 459-460 MHz band will have make to incumbent Little LEO operators can be reasonably reflected in the market price.

V. CONCLUSION

For the foregoing reasons, Final Analysis urges the Commission to allocate the 455-456 and 459-460 MHz bands to the Little LEO service in the public interest, convenience and necessity.

Respectfully submitted,

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